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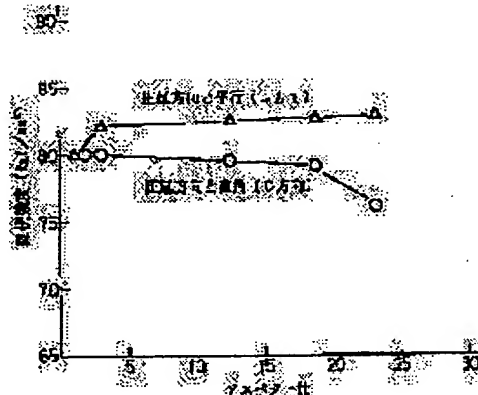
ONO TAKAHIDE

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**(54) METAL FOIL FOR TAB TAPE HAVING HIGH YOUNG'S MODULUS AND HIGH YIELD STRENGTH AND ITS PRODUCTION****(57)Abstract:**

**PURPOSE:** To produce a metal foil excellent in lead deformation resisting- characteristic and heat resisting strength characteristic as a lead foil for TAB.

**CONSTITUTION:** An alloy having a composition consisting of, by weight, 20-95% Cu, 0.3-11% Al, 0.05-3.0% Mn, 0.005-3.5% Ti, 0.5-10% Cr, 0.001-1.5% Mo, and the balance Fe with inevitable impurities is melted and cast, which is hot-rolled at 700-1000° C into a metal plate of 1.0-8mm plate thickness. This metal plate is subjected to primary cold rolling at 50-95% draft, to annealing at 800-1000° C, and then to secondary cold rolling at 1-70% draft. The resulting sheet is further subjected to solution heat treatment at 700-1000° C, to rapid cooling, and successively to aging treatment at 350-650° C. By this method, the metal foil wherein the aspect ratio of crystalline grain size and sheet thickness are regulated to  $\leq 20$  and  $\leq 80 \mu\text{m}$ , respectively, can be produced.

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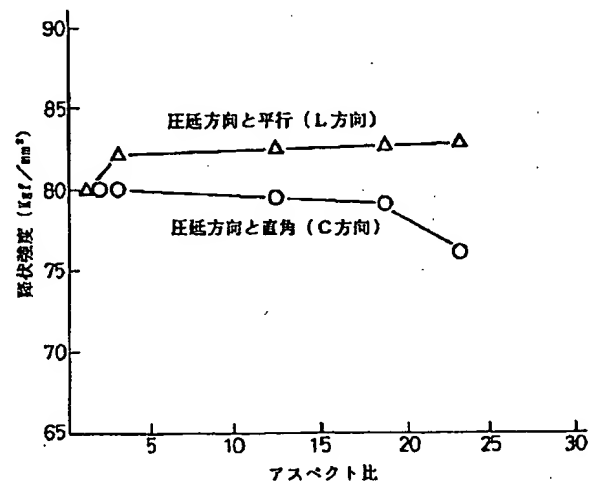
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(54)【発明の名称】 高ヤング率・高降伏強度を有するTABテープ用金属箔およびその製造方法

(57)【要約】 (修正有)

【目的】 TAB用リード箔として耐リード変形特性および耐熱強度特性に優れた金属箔およびその製造方法を提供することを目的とする。

【構成】 Cu:20~95重量%、Al:0.3~11重量%、Mn:0.05~3.0重量%、Ti:0.005~3.5重量%、Cr:0.5~10重量%、Mo:0.001~1.5重量%を含有し、残部が不可避免の不純物およびFeよりなる合金を溶解铸造後700~1000℃の温度範囲で1.0~8mm板厚の金属板に熱間圧延し、該金属板を圧下率50~95%で一次冷間圧延を行い、次いで800~1000℃の温度範囲で焼鈍した後、圧下率1~70%で二次冷間圧延しさらに700~1000℃の温度範囲で溶体化処理後急冷を行い、続いて350~650℃の温度範囲で時効処理を行うことにより、結晶粒度のアスペクト比が20以下、板厚が80μm以下である金属箔を製造する。



## 【特許請求の範囲】

【請求項1】 Cu:20~95重量%、Al:0.3~11重量%、Mn:0.05~3.0重量%、Ti:0.005~3.5重量%、Cr:0.5~10重量%、Mo:0.001~1.5重量%を含有し、残部が不可避的不純物およびFeよりなる合金において、結晶粒度のアスペクト比（結晶粒の圧延方向と圧延直角方向の長さの比）が20以下、板厚が80 $\mu$ m以下であることを特徴とする高ヤング率・高降伏強度を有するTABテープ用金属箔。

【請求項2】 Fe含有量に対するCr含有量の重量比が5.5~13.5%である請求項1記載の金属箔。

【請求項3】 合金成分として、さらにZr, Si, Ni, Zn, Sn, Nb, P, La, Ce, Y, V, Ca, Be, MgまたはHfの1種または2種以上を合計で0.005~8重量%、CまたはBの1種または2種を合計で0.005~2重量%含有する請求項1または2記載の金属箔。

【請求項4】 金属箔の表面に、Ni, Cu, Ag, Auまたはそれら金属系合金メッキ、Sn-PbメッキまたはSnメッキが単層または複層で0.001~0.02 $\mu$ m施された請求項1, 2または3記載の金属箔。

【請求項5】 有効量の請求項1, 2または3に記載の合金を溶解、造塊後700~1000 $^{\circ}$ Cの温度範囲で熱間圧延し、該金属板を圧下率50~95%で一次冷間圧延を行い、次いで800~1000 $^{\circ}$ Cの温度範囲で焼鈍した後、圧下率1~70%で二次冷間圧延し、さらに700~1000 $^{\circ}$ Cの温度範囲で溶体化処理後急冷し、続いて350~650 $^{\circ}$ Cの温度範囲で時効処理を行うことを特徴とする特性異方性の小さい、耐リード変形特性と耐熱強度に優れた高ヤング率・高降伏強度を有するTABテープ用金属箔の製造方法。

【請求項6】 有効量の請求項1, 2または3に記載の合金を溶解、造塊後、700~1000 $^{\circ}$ Cの温度範囲で熱間圧延し、該熱延板を圧下率50~90%で一次冷却圧延を行い、次いで800~1000 $^{\circ}$ Cの温度範囲で焼鈍した後急冷し、しかる後圧下率1~70%で二次冷間圧延を行い、続いて350~650 $^{\circ}$ Cの温度範囲で時効処理を行うことを特徴とする特性異方性の小さい、耐リード変形特性と耐熱強度に優れた高ヤング率、高降伏強度を有するTABテープ用金属箔の製造方法。

【請求項7】 二次冷間圧延を圧下率1~15%で行う請求項5または6記載の製造方法。

【請求項8】 時効処理後の金属箔に、Ni, Cu, Ag, Auまたはそれらの合金メッキ、Sn-PbメッキまたはSnメッキを単相または複相で0.001~0.02 $\mu$ m施す請求項5, 6または7に記載の製造方法。

## 【発明の詳細な説明】

## 【0001】

【産業上の利用分野】本発明は、半導体集積回路素子の

外部回路への接続用導電箔材料で、TAB法などで用いるテープ状金属箔に関する。

## 【0002】

【従来の技術】従来半導体集積回路素子上には外部回路接続用Al製電極パッドが設けられ、該電極パッドがリードフレーム・セラミックス基板などの外部回路とAu線などのワイヤーで接続されているのが一般的であった。しかしながら、今日の高集積化されたICにおいては、上記パッドの数を大幅に増加させる必要があるため従来技術の延長では製造性や加工技術上ならびにワイヤー接続上の抜本的技術革新が必要になり、リードテープを用いる同時ボンディング法のTAB法などが一部で実用化され、今後ますます増加することが見込まれている。

【0003】一般には、リード部を予め開口された絶縁樹脂材（多くはポリイミドフィルム）に電解Cu箔または圧延Cu箔を接着した後、フォトリソエッチングによりリード回路を形成させる。これをTABに構成した2例の断面図を図1（A, B）に示す。また実装時にはSiチップとAuなどのバンプ材と接続用リードの先端が熱圧着されるものであり、前もってAu, Sn-Pbメッキなどが施され、250~350 $^{\circ}$ Cに加熱してからバンプ部と接続結合される。

【0004】小型高集積化された半導体集積回路では接続リードの幅狭化が重要であり、これらの実現のためにはエッチング処理上リードテープが50 $\mu$ m以下の箔状であることが必要であり、さらにこのリードテープは製造時の変形を抑え、高温強度が高くかつ折り曲げ実装型においてはフレキシビリティも要求される。また圧延方向と圧延直角方向での特性の差（異方性）が小さいことが重要である。既存の圧延Cu箔は耐変形特性、耐熱強度ならびに異方性が電解箔より劣っているため、これらの特性を改善した特開昭62-189738号公報に開示された技術などがあるが、50 $\mu$ m以下の厚みで用いるTAB法などの製造上での変形や耐熱変形特性を抑制するためには、強度のみの向上では本特性への効果が小さくリードの耐変形特性が不十分であった。

【0005】本発明者はこれについて種々の実験を行った結果、Cu中にFeを20~95重量%の範囲で添加することで大幅なヤング率の向上（図2）と降伏強度の向上により変形を抑制できる（導電性の低下も実用上問題ない範囲に抑えた状態において）ことが明らかになった。このことはリードの耐変形特性には最大強度のみならず耐変形特性に効果的に働くヤング率を向上させることの重要性を意味する。またCu基合金でヤング率を向上させる手段としてNi添加を行うことにより同様の効果が得られる（日本伸銅協会「銅および銅合金の基礎と工業技術」昭和63年、P. 476）ことは知られているが、この場合Cu中のNiは全率固のため、導電性の低下が大きく（日本伸銅協会「銅および銅合金の基礎と

工業技術」昭和63年、P. 421) TAB用箔には適さない。

【0006】

【発明が解決しようとする課題】本発明はこのTAB用リード箔として耐リード変形特性および耐熱強度特性に優れた高ヤング率・高降伏強度を有する金属箔およびこの金属箔を低コストで実現できる製造方法を提供することを目的とする。

【0007】

【課題を解決するための手段】本発明の要旨とするところは、Cu: 20~95重量%、Al: 0.3~11重量%、Mn: 0.05~3.0重量%、Ti: 0.005~3.5重量%、Mo: 0.001~1.5重量%を含有し、残部が不可避免の不純物およびFeよりなる合金において結晶粒度のアスペクト比が20以下、板厚80μm以下であることを特徴とする金属箔にある。

【0008】本発明の金属箔は上記の組成を持つインゴット又はスラブを700~1000℃の温度で1.0~8mmの板厚の金属板に熱間圧延し、50~95%の一次冷間圧延を行ったあと引き続き焼鈍を施し、次いで圧下率1~15%の二次冷間圧延を行い、さらに溶体化処理後急冷を行い続いて時効処理を施すことによって得られるもので、アスペクト比が20以下で特性異方性の小さい、かつ高ヤング率と高降伏強度を有する金属箔を得ることができる。さらにコイルの状態またテープ状に加工後Ni, Cu, Ag, Auなどのメッキまたはそれら合金メッキおよびSn-PbメッキまたはSnメッキを単層または複層で0.001~0.02μm施すことを特徴とする。

【0009】本発明においては上記金属薄板を得るために、化学組成・鑄造条件・一次、二次冷間圧延・焼鈍・時効処理の各条件の組合せおよびNi, Cu, Au, Agまたはそれらの合金メッキおよびSn-Pb, Snのメッキ条件などを規定した。

【0010】

【作用】以下本発明の構成要件の限定理由を説明する。まず、合金の化学組成の限定理由は以下の通りである。本発明のFe-Cu箔合金組成で高ヤング率と高降伏強度を得るためにはCu中に多量のFe, ZrおよびCrなどを強制固溶させる必要があり、図2に示すようにFe含有量が5%以上で15000kg・f/mm<sup>2</sup>以上の高ヤング率が得られるが、5%未満では前記効果が小さく80%以上では十分な導電性が得られない。なお、本発明では0.2%耐力を降伏強度とした。

【0011】つぎにAlを0.3~11.0重量%に規定するのは0.3%未満では熱間加工性への向上効果が少なく、11.0重量%超では熱間加工性向上効果が飽和する上にコストが大きくなるからである。さらにMnはAlとの複合効果で熱間加工性を向上させ、0.05重量%未満では効果が少なく、3重量%超では効果が飽

和するため、0.05~3.0重量%の範囲に規定する。またTiを0.005~3.5重量%に規定するのは0.005%未満では導電性向上への効果が少なく、3.5重量%超では導電性向上への効果が飽和する上に造塊、冷間加工性などの製造性を阻害するからである。またMoを0.001~1.5重量%に規定するのは最終製品としての耐食性をSn-Pb・Agメッキ性を劣化させずにCrとの複合効果で向上させるためであり、Moの含有量が0.001重量%未満では隙間腐食性への効果が少なく、1.5重量%超では隙間腐食性への効果が飽和する上にコストが大きくなる。さらにCrをFe相中で5.5~13.5重量%に規定するのは、素材の耐食性を前記Moとの複合効果で向上させるためであり、5.5重量%未満ではその効果が不十分であり、また13.5重量%を超えても耐食性への効果が飽和する上にSn-Pb, Agメッキ性などを劣化させるのでこの範囲に限定する。

【0012】さらにZr, Si, Ni, Zn, Sn, Nb, Zr, P, La, Ce, Y, V, Ca, Be, MgまたはHf, の1種または2種以上を0.005~8重量%、CまたはBの1種または2種を0.005~2重量%の範囲で添加することは特にインゴットやスラブの組織制御やヤング率、降伏強度および耐熱強度向上、加工性、各種メッキ性を改善する場合に必要であるからであり、これらの元素を必要に応じて添加する。特にFe中のCr含有量が6重量%、Mo含有量が0.01重量%を超える成分では、均一組織の制御のためにSi, Ti, Zr, La, Ce, Y, Hf, C, Bなどを0.005重量%以上上記範囲内で添加することは、本発明の特徴を成す組織、すなわちCrおよびMoを含むFe相とCu相が均一に微細分散して加工・熱処理後板厚方向で10μm以下の厚さの組織を得る上で重要である。(それ以外は原料および溶製時に不可避免的に混入される不純物元素とする。)

【0013】溶解、造塊後所望の板厚に熱間圧延後し、引続いて一次冷間圧延を行う。これは最終製品として必要な板厚を得ると共に、圧下率50~95%の一次冷間圧延を実施することにより、その後の焼鈍処理による加工性付与を行う。そしてその時の焼鈍は徐加熱・徐冷却型(BAF型)および急速加熱型(連続焼鈍型)のいずれにおいても一次冷間圧延後蓄積した加工歪みにより回復再結晶を生じさせるに必要な温度、すなわち800~1000℃の温度範囲で0.2~180分間保持することで行う。その後二次冷間圧延を圧下率1~70%で行った後に溶体化処理と急冷を行いその後時効処理を行う。溶体化処理は添加成分を過飽和状態に固溶するために700~1000℃の温度範囲で0.2~180分間保持することにより行われるが、後工程として0.5~5000℃/分の冷却速度で急冷することにより時効処理をより効果的に行うことができる。急冷には冷却媒体

として水や不活性ガスが用いられる。以上の処理工程によりアスペクト比2.0以下の組織（図3にアスペクト比と降伏強度の圧延方向に平行方向と直角方向の特性について示した）が得られる。なお、板厚1～1.5mmの範囲の金属板に圧下率50～95%の一次冷間圧延を行い、次いで焼鈍を施し、二次冷間圧延を圧下率1～15%の範囲で行うと特性異方性（ここでは降伏強度と導電性および加工性の圧延方向に平行方向と直角方向の特性の差を主に言う）がより小さく、強度、導電性が一層良好な金属箔を得ることができる。また、上記の焼鈍処理に上記の急冷工程を付加することにより溶体化処理を焼鈍処理に兼ねさせてもよい。

【0014】なお時効処理はヤング率と降伏強度と導電性を向上させるために、製造工程上必須のものであり、化学組成と前工程条件により適正な温度を選定すべきである。その条件としては、加熱温度が低過ぎると析出物の周りに歪みが生じるため導電性や伸びの低下が生じ、また目的の導電性を得るために設備制約や製造効率に影響してコスト増になる。また加熱温度が高過ぎると析出量が少なくなり充分な降伏強度と耐熱強度が得られなくなる。このため、350～650℃で30～500分の時効処理が適正条件である。

【0015】本発明のリードテープ箔にAu, Cu, N

iなどの薄メッキを行い、TABなど製品化時の品質安定性・信頼性の確保を行ってもよい。上記金属箔は、コイル状またはスリット状に加工後Ni, Cu, Ag, Auなどのメッキまたはそれら合金メッキ、またはSn-Pb, Snなどのメッキを施した後または、予めTAB品として加工された後に、前記メッキ処理を施す場合でもメッキは以下の条件で行う。

【0016】メッキはかかる素板にアルカリ系脱脂剤を用いて電解または浸漬脱脂を行い、さらに酸洗により表面を活性化した後に所望の金属浴または合金浴を用いて電気または浸漬メッキを行う。メッキ層の厚みは通常0.001～0.02μm程度の範囲であるが、密着性、厚み均一性、ならびに経済性から見て0.001～0.01μmの範囲が良好である。0.001μm未満ではピンホールが存在により信頼性が劣化する。また0.01μmを超えると密着性および厚みの均一性が劣化する。

【0017】

【実施例】

実施例1

表1、2に本発明の成分範囲の合金A、CとD、F、Gおよび比較の成分範囲のD～Oの化学組成を示す。

【表1】

## \* 比較成分

供試材	Fe	Cu	Cr	Ti	Al	Mo	Mn	その他の 元素	100Cr/ Fe(%)
A	Balance	30.5	6.8	1.0	3.8	0.01	0.15		11.0
B	Balance	49.5	2.8	0.8	3.2	0.03	0.15		6.0
C	Balance	80.3	1.0	0.3	2.2	0.01	0.15		5.6
*D	Balance	15.5	6.0	0.5	2.6	0.02	0.13		7.7
*B	Balance	96.5	0.8	0.5	2.5	0.02	0.15		3.7
*F	Balance	80.3	1.5	0.5	0.25	0.01	0.15		8.5
*G	Balance	80.2	1.5	0.5	12.5	0.05	0.13		8.9
*H	Balance	80.3	1.5	0.5	0.26	0.02	0.03		8.6
*I	Balance	80.6	1.5	0.5	0.23	0.01	3.50		8.6
*J	Balance	80.3	1.5	0.3	0.25	0.02	3.65		8.6
*K	Balance	80.6	1.5	3.7	2.3	0.01	0.15		8.6
*L	Balance	80.3	1.3	0.2	2.2	0.0005	0.15		7.1
*M	Balance	80.3	1.5	0.5	2.3	1.67	0.13		8.5
*N	Balance	80.3	0.5	0.5	2.2	0.02	0.15		2.7
*O	Balance	80.5	2.6	0.5	2.3	0.02	0.13		15.0

【表2】

(表1のつゞき)

P	Balance	80.3	1.5	0.5	2.3	0.02	0.13	Zr:0.52	8.7
Q	Balance	80.3	1.2	0.5	2.2	0.01	0.15	Si:0.16	6.7
R	Balance	80.8	1.5	0.5	2.3	0.02	0.13	Ni:0.62	9.1
S	Balance	80.3	1.5	0.5	2.2	0.01	0.15	Zn:0.35	8.7
T	Balance	80.3	1.3	0.5	5.3	0.01	0.13	Sn:0.25	7.4
U	Balance	80.3	1.5	0.5	5.3	0.01	0.13	Nb:0.53	8.7
V	Balance	80.3	1.5	0.5	5.5	0.02	0.15	P:0.76	8.9
W	Balance	80.5	1.5	0.5	5.5	0.02	0.13	La:0.85	9.0
X	Balance	80.3	1.2	0.5	5.3	0.01	0.15	Ce:0.65	6.9
Y	Balance	80.3	1.5	0.3	5.5	0.02	0.13	Y:0.72	8.8
Z	Balance	80.3	1.3	0.5	2.3	0.01	0.35	V:0.63	7.5
AA	Balance	80.6	1.5	0.3	2.2	0.02	0.35	Ca:1.06	9.1
BB	Balance	80.3	1.3	0.5	2.3	0.02	0.33	Br:0.68	7.6
CC	Balance	80.3	1.5	0.5	2.3	0.01	0.35	Mg:0.55	8.7
DD	Balance	80.3	1.5	0.3	2.2	0.02	0.35	Hf:0.23	8.5
EE	Balance	80.3	1.5	0.5	2.3	0.02	0.33	C:0.33	8.6
FF	Balance	80.3	1.5	0.5	2.2	0.01	0.33	B:0.002	8.5

【0018】表3、4に得られた合金の材質特性を示す。高周波誘導加熱装置で溶解真空雰囲気中で表1、2のA～FFに示される化学組成を有する合金を溶解鑄造した後、950℃で熱間圧延を行い、1.0mm板厚の金属板を得た後に表面研削で板厚0.8mmに加工後、圧下率90%で一次冷間圧延を行った。

【0019】焼鈍は1000℃で1分間行い、引続き、二次冷間圧延を圧下率2%で行った後900℃で30分間の溶体化処理を行い、冷却速度3000℃/分で水冷後550℃で6時間の時効処理を施した。引張特性はJIS13B引張試験片(引張り速度:10mm/min)により0.2%耐力と最大強度を求め、さらに室温と350℃で5分加熱後の特性を測定した。耐変形特性はステイフネス(ASTM-F113-77に準じて10w×50L×tのサンプルに150g・cmの曲げモーメントを付与)評価法によるたわみ量から求めた。ヤング率は共振法(サンプルサイズ:10w×100L×t)により測定して求めた。導電率は4端子法、耐食性はJIS-Z2371に準じて塩水噴霧試験を96時間行い、試料全面での赤錆発生面積率により判定を行った。

【0020】メッキ性でのSn-Pbについては濡れ面

積率で95%以上を合格とした。またAgメッキ性はCuスライクメッキを約0.01μmメッキ後、Agを約0.01μmメッキした後大気中430℃で3分加熱後メッキ表面での膨れの発生により判定した。表中には圧延Cu箔、電解Cu箔の特性も比較に加えた。なお、供試材F、Hは熱間加工割れにより特性評価ができなかった。

【0021】試料番号4はCu添加量が20重量%以下の場合であり、導電率が低い。また試料番号5はCu添加量が95重量%以上の場合でヤング率に有効に働くFeの添加量が少ないためにヤング率と降伏強度が低く、試料番号6、7、8はAl、Mn添加量が多いため導電性が低い。試料番号9はTi含有量が3.5%以上で冷間加工性が劣る。試料番号10はMoが低いため隙間腐食性が不良であり、試料番号11はコストが高い。また試料番号12はCrが低いため耐食性が低く、試料番号13は半田濡れ性、Agメッキ耐熱性が劣る。

【0022】本発明は以上の比較例に比べその特性が優れていることは明らかである。

【0023】

【表3】

試料番号	供試材		左:0.2 耐力 右:最大強度 (Kgf/mm <sup>2</sup> )				スティフネス 変形量 (mm)	ヤング率 Kgf Kgf/mm <sup>2</sup>	導電率% IACS	隙間腐食性	耐食性	半田濡れ性	Agメッキ耐熱性
			室 温		350℃								
1	A	本発明	86	87	86	87	4.1	19800	25	○	○	○	○
2	B	本発明	83	85	80	82	5.6	19100	33	○	○	○	○
3	C	本発明	75	77	75	77	7.7	17500	61	○	○	○	○
4	D	比較例	98	98	98	100	7.6	19800	11	○	○	○	○
5	E	比較例	57	62	57	62	8.5	14500	63	○	○	○	○
6	G	比較例	65	70	65	70	8.0	16100	13	○	○	○	○
7	I	比較例	83	85	83	85	7.2	17200	15	○	○	○	○
8	J	比較例	77	78	76	78	7.5	17000	13	○	○	○	○
9	K	比較例	77	78	76	78	7.3	17100	70	○	○	○	○
10	L	比較例	76	78	75	80	7.5	17200	60	△	○	○	○
11	M	比較例	77	78	75	78	7.6	17000	62	○	○	○	○
12	N	比較例	75	77	75	77	7.6	17000	65	△	△	○	○
13	O	比較例	77	78	75	78	7.3	17100	63	○	○	△	△

【表4】

(表3のつづき)

14	P	本発明	75	79	78	79	7.5	17100	63	○	○	○	○
15	Q	本発明	76	80	79	80	7.5	17000	63	○	○	○	○
16	R	本発明	76	81	80	81	7.6	17000	63	○	○	○	○
17	S	本発明	74	78	77	78	7.5	17000	63	○	○	○	○
18	T	本発明	75	79	78	79	7.5	17100	63	○	○	○	○
19	U	本発明	76	80	79	80	7.3	17200	65	○	○	○	○
20	V	本発明	76	81	80	81	7.3	17100	65	○	○	○	○
21	W	本発明	76	80	79	80	7.5	17100	63	○	○	○	○
22	X	本発明	76	80	79	80	7.3	17000	65	○	○	○	○
23	Y	本発明	76	81	80	81	7.2	17000	65	○	○	○	○
24	Z	本発明	77	81	80	81	7.3	17100	65	○	○	○	○
25	AA	本発明	75	80	78	80	7.5	17100	63	○	○	○	○
26	BB	本発明	77	81	80	81	7.5	17000	63	○	○	○	○
27	CC	本発明	75	82	81	82	7.6	17000	65	○	○	○	○
28	DD	本発明	78	83	82	83	7.3	17000	65	○	○	○	○
29	BB	本発明	78	82	81	82	7.6	17100	63	○	○	○	○
30	FF	本発明	78	82	81	82	7.3	17100	63	○	○	○	○
圧延Cu箔 比較例			31.0	36.0	28.5	33.5	15.2	13200	96	○	○	○	○
電解Cu箔 比較例			33.5	38.5	32.5	36.5	13.5	13000	98	○	○	○	○

## 【0024】実施例2

表5では表1および2に示す供試材C、Pを次の工程で加工した後得られた材料の評価を示した。すなわち、熱間圧延により得た1mm板厚の金属板に表面研削を行った後圧下率35～96%の範囲で一次冷間圧延を行って板厚0.055mmの薄板とし、この薄板に焼鈍を1000℃で60秒間施し、窒素ガスで100℃/分の冷却速度で冷却した後圧延率1～75%で二次冷間圧延を行った。このようにしてアスペクト比を1.3～23.5まで変化したのち550℃で6時間の時効処理を行い、圧延方向と平行(L)、圧延方向と直角(C)におけるヤング率、降伏強度および導電率および加工性(密着曲げにより判定)の評価を得てこの結果を上記表に示した

ものである。アスペクト比の評価は光学顕微鏡により圧延方向断面での板厚1/4層での100倍の組織観察による10視野での圧延方向と板厚方向での組織長さ比の平均値を用いた。特性評価は実施例1と同様にヤング率と降伏強度および導電率について測定を行った。以下の結果より本法によるアスペクト比20以下にすることで、特性異方性の小さく優れたヤング率と降伏強度ならびに導電性を有する材料が得られることは明らかである。なお、試料No. 31及び37は一次冷間圧延率が本発明の条件を充足していないので再結晶せず加工性が劣化している。

## 【0025】

【表5】

試料番号	供試材		一次冷間圧延率 (%)	二次冷間圧延率 (%)	アスペクト比	降伏強度 (Kgf/mm <sup>2</sup> )		導電性 (%IACS)		加工性	
						L	C	L	C	L	C
31	C	比較例	35	1	1.3	80	80	63	63	○	△
32	C	本発明	55	1	1.7	82	80	65	63	○	○
33	C	本発明	60	5	2.8	81	80	65	63	○	○
34	C	本発明	90	20	12.5	82	81	65	63	○	○
35	C	本発明	93	30	17.5	85	83	65	62	○	○
36	C	比較例	96	75	23.5	87	75	65	58	○	○
37	P	比較例	35	1	1.3	80	80	63	66	○	△
38	P	本発明	55	1	1.7	81	80	65	66	○	○
39	P	本発明	60	5	2.8	81	80	67	65	○	○
40	P	本発明	90	20	12.5	82	81	67	66	○	○
41	P	本発明	93	30	17.5	83	83	67	65	○	○
42	P	比較例	96	75	23.5	83	73	68	60	○	○

## 【0026】

【発明の効果】本発明は、TAB用リード箔として耐リード変形特性、耐熱性に優れ、また高ヤング率、高降伏強度ならびに導電性に優れた金属箔を提供することができるので、その工業的効果は顕著である。

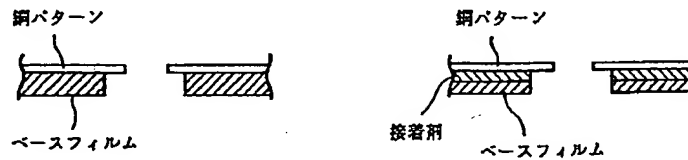
【図面の簡単な説明】

【図1】一般的な二層TABテープ2種類の断面図である。

【図2】Fe相中のCu含有量(%)とヤング率及び導電性との関係を示す図である。

【図3】アスペクト比と降伏強度の異方性の関係を示す図である。

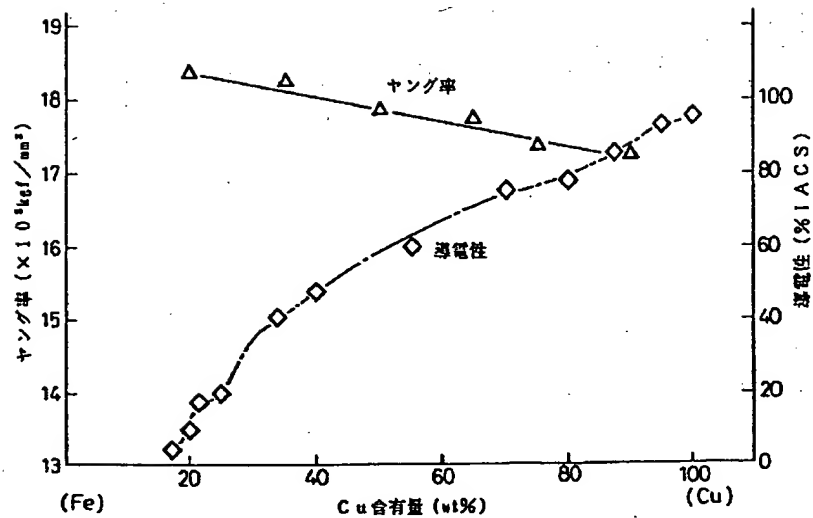
【図1】



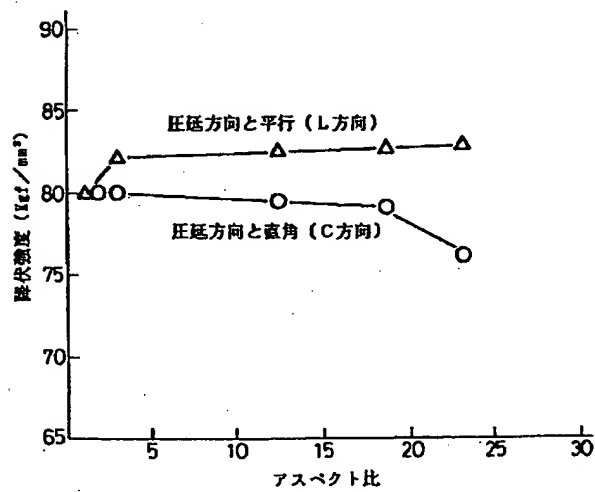
A: 2層TABテープ

B: 3層TABテープ

【図2】



【図3】



フロントページの続き

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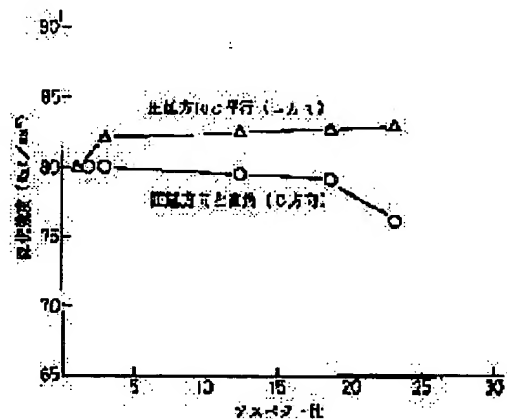
ENDO MICHIO

## (54) METAL FOIL FOR TAB TAPE HAVING HIGH YOUNG'S MODULUS AND HIGH YIELD STRENGTH AND ITS PRODUCTION

(57)Abstract:

PURPOSE: To produce a metal foil excellent in lead deformation resisting-characteristic and heat resisting strength characteristic as a lead foil for TAB.

CONSTITUTION: An alloy having a composition consisting of, by weight, 20-95% Cu, 0.3-11% Al, 0.05-3.0% Mn, 0.005-3.5% Ti, 0.5-10% Cr, 0.001-1.5% Mo, and the balance Fe with inevitable impurities is melted and cast, which is hot-rolled at 700-1000°C into a metal plate of 1.0-8mm plate thickness. This metal plate is subjected to primary cold rolling at 50-95% draft, to annealing at 800-1000°C, and then to secondary cold rolling at 1-70% draft. The resulting sheet is further subjected to solution heat treatment at 700-1000°C, to rapid cooling, and successively to aging treatment at 350-650°C. By this method, the metal foil wherein the aspect ratio of crystalline grain size and sheet thickness are regulated to  $\leq 20$  and  $\leq 80\mu\text{m}$ , respectively, can be produced.



## LEGAL STATUS

[Date of request for examination]

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**CLAIMS**

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[Claim]

[Claim 1] Cu: 20-95 % of the weight, aluminum: 0.3-11 % of the weight, Mn: 0.05-3.0 % of the weight, In the alloy with which Ti: 0.005-3.5 % of the weight, Cr: 0.5-10 % of the weight, and Mo: 0.001-1.5 % of the weight are contained, and the remainder consists of an unescapable impurity and Fe. The metallic foil for TAB tapes which has the high Young's modulus and quantity yield strength characterized by for the aspect ratio (ratio of the length of the rolling direction of crystal grain and the rolling right-angled orientation) of a grain size number being 20 or less, and board thickness being 80 micrometers or less.

[Claim 2] The metallic foil of the claim 1 publication whose weight ratio of Cr content to Fe content is 5.5 - 13.5%.

[Claim 3] The claim 1 which contains one sort of Zr, Si, nickel, Zn, Sn, Nb, P, La, Ce, Y, V, calcium, Be, Mg, or Hf, or two sorts or more in the sum, and contains one sort of C or B, or two sorts 0.005 to 2% of the weight in the sum 0.005 to 8% of the weight further as an alloy content, or a metallic foil given in two.

[Claim 4] The claims 1 and 2 to which nickel, Cu, Ag, Au or these metals system alloy plating, Sn-Pb plating, or 0.001-0.02 micrometers of Sn plating were given in the monolayer or the double layer on the surface of the metallic foil, or a metallic foil given in three.

[Claim 5] The hot rolling of the alloy of a publication is carried out to the claims 1, 2, or 3 of an effective dose by the 700-1000-degree C temperature requirement after lysis and an ingot making. After performing a primary cold rolling at 50 - 95% of rolling reductions and annealing this metal plate by the 800-1000-degree C temperature requirement subsequently, Carry out a secondary cold rolling at 1 - 70% of rolling reductions, and it quenches after solution treatment by the 700-1000 more-degree C temperature requirement. Then, the manufacture technique of the metallic foil for TAB tapes of having high Young's modulus and quantity yield strength excellent in the parvus, the lead-proof deformation property, and the heat-resistant intensity of the property anisotropy characterized by performing an aging treatment by the 350-650-degree C temperature requirement.

[Claim 6] The hot rolling of the alloy of a publication is carried out to the claims 1, 2, or 3 of an effective dose by the 700-1000-degree C temperature requirement after lysis and an ingot making. It quenches, after performing primary-cooling-of-concrete rolling at 50 - 90% of rolling reductions and annealing this \*\*\*\*\* by the 800-1000-degree C temperature requirement subsequently. The manufacture technique of the metallic foil for TAB tapes of having the high Young's modulus excellent in the parvus, the lead-proof deformation property, and the heat-resistant intensity of the property anisotropy characterized by performing a secondary cold rolling and performing an aging treatment by the 350-650-degree C temperature requirement continuously at 1 - 70% of rolling reductions after an appropriate time, and high yield strength.

[Claim 7] The claim 5 which performs a secondary cold rolling at 1 - 15% of rolling reductions, or the manufacture technique given in six.

[Claim 8] The manufacture technique given in the claims 5, 6, or 7 which give nickel, Cu, Ag, Au or those alloy plating, Sn-Pb plating, or 0.001-0.02 micrometers of Sn plating to the metallic foil after an aging treatment by the single-phase circuit or the diplophase.

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[Translation done.]

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**DETAILED DESCRIPTION**

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[Detailed description]

[0001]

[Field of the Invention] this invention is an electric conduction foil material for connection to the external circuit of a semiconductor integrated circuit element, and relates to the tape-like metallic foil used by the TAB method etc.

[0002]

[Prior art] It was common that the electrode pad for external circuit connection made from aluminum was conventionally prepared on a semiconductor integrated circuit element, and this electrode pad was connected with wires, such as external circuits, such as a leadframe ceramic substrate, and Au line. However, in IC by which today was integrated highly, in order to make the number of the above-mentioned pads increase sharply, by extension of the conventional technique, the radical technical innovation on manufacturability, manipulation technique, and wire connection is needed, the TAB method of the simultaneous bonding method using a lead tape etc. is put in practical use by the part, and increasing increasingly from now on is expected.

[0003] After pasting up an electrolysis Cu foil or a rolling Cu foil on the insulating resin material (many are polyimide films) by which opening was beforehand carried out in the lead section generally, a lead circuit is made to form by photoresist etching. The cross section of two examples which constituted this in TAB is shown in drawing 1 (A, B). Moreover, thermocompression bonding of Si chip, bump material, such as Au, and the nose of cam of the lead for connection is carried out at the time of a package, Au, Sn-Pb plating, etc. are given beforehand, and after heating at 250-350 degrees C, connection combination is carried out with the bump section.

[0004] In the semiconductor integrated circuit by which small high integration was carried out, narrow-izing of a connection lead is important and there is, in order to be these implementation, it is required for a lead-on etching processing tape to have the shape of a foil 50 micrometers or less, this lead tape suppresses the deformation at the time of a manufacture further, and a high temperature strength is high, and a flexibility is also demanded in a bending package type. moreover, the difference (anisotropy) of the property in a rolling direction and the rolling right-angled orientation -- the parvus -- things are important Since the deformation-proof property, the heat-resistant intensity, and the anisotropy are inferior to an electrolysis foil in the existing rolling Cu foil, although there is technique indicated by the Provisional-Publication-No. 189738 [ 62 to ] official report which has improved these properties, in order to suppress the deformation on a manufacture of the TAB method used by the thickness of 50 micrometers or less, and a heat-resistant deformation property, the effect to this property is small and the enhancement only in an intensity of the deformation-proof property of a lead was inadequate.

[0005] As a result of this invention person's conducting various experiments about this, what (setting in the status that the conductive fall was also suppressed in the domain which is satisfactory practically) deformation can be suppressed for by the enhancement ( drawing 2 ) in large Young's modulus and enhancement in yield strength by adding Fe in 20 - 95% of the weight of the domain in Cu became clear. This means the importance of raising the Young's modulus effectively committed not only in the maximum intensity but in a deformation-proof property in the deformation-proof property of a lead. Moreover, although what the same effect is acquired for by performing nickel addition as a means which raises Young's modulus with Cu base alloy (copper, and Japan Brass Makers Association "footing [ of a copper alloy ] and technology" Showa 63, P.476) is known, in this case, for all \*\*\*\*s, a conductive fall is large (copper, and Japan Brass Makers Association "footing [ of a copper alloy ] and technology" Showa 63, P.421), and nickel in Cu does not fit the foil for TAB.

[0006]

[Object of the Invention] this invention aims at offering the manufacture technique that the metallic foil which has the high Young's modulus and quantity yield strength which was excellent in the lead-proof deformation property and the heat-resistant strength property as this lead foil for TAB, and this metallic foil are realizable by the low cost.

[0007]

[The means for solving a technical problem] The place made into the summary of this invention contains Cu:20-95 % of the weight, aluminum:0.3-11 % of the weight, Mn:0.05-3.0 % of the weight, Ti:0.005-3.5 % of the weight, and Mo:0.001-1.5 % of the weight, and is in the metallic foil characterized by the aspect ratios of a grain size number being 20 or less and 80 micrometers or less of board thickness in the alloy with which the remainder consists of an unescapable impurity and Fe.

[0008] The metallic foil of this invention carries out the hot rolling of the ingot or slab with the above-mentioned composition to the metal plate of 1.0-8mm board thickness at the temperature of 700-1000 degrees C. It is what is obtained by giving an annealing succeeding after performing 50 - 95% of a primary cold rolling, performing the secondary cold rolling of 1 - 15% of rolling reductions subsequently, performing the quenching after solution treatment further, continuing, and giving an aging treatment. An aspect ratio can obtain the metallic foil which has the parvus and the high Young's modulus, and high yield strength of a property anisotropy or less by 20. It is characterized by furthermore giving plating after [ nickel, Cu, Ag, and Au ] processing it the shape of the status and a tape of a coil etc. or these alloys plating and Sn-Pb plating, or 0.001-0.02 micrometers of Sn plating in a monolayer or a double layer.

[0009] in order to obtain the above-mentioned metal sheet metal in this invention -- the combination of each conditions of a chemical composition, a casting condition and primary one, and a secondary cold rolling, an annealing and an aging treatment and nickel, Cus, Aus and Ag or those alloy plating, and Sn- the plating conditions of Pb and Sn etc. were specified

[0010]

[Operation] The ground for limitation of the requirements for a configuration of this invention is explained below. First, the ground for limitation of the chemical composition of an alloy is as follows. As compulsion \*\*\*\* of a lot of Fe, Zr, Cr, etc. in Cu is carried out in order to obtain high Young's modulus and high yield strength by Fe-Cu foil alloy composition of this invention, and shown in drawing 2, Fe content is 15000kg and f/mm<sup>2</sup> at 5% or more. Although the above high Young's modulus is obtained, at less than 5%, conductivity with it is not acquired. [ the aforementioned small effect and ] [ sufficient at 80% or more ] In addition, in this invention, proof stress was made into yield strength 0.2%.

[0011] Specifying aluminum to 0.3 - 11.0% of the weight below has few enhancement effects to hot-working nature at less than 0.3%, and it is because the hot-working disposition top effect is saturated with \*\* upwards 11.0% of the weight and a cost becomes large. Furthermore, at less than 0.05 % of the weight, hot-working nature is raised by the compound effect with aluminum, Mn has few effects, and since an effect is saturated with \*\* 3% of the weight, it is specified in 0.05 - 3.0% of the weight of a domain. Moreover, specifying Ti to 0.005 - 3.5% of the weight has few effects to conductive enhancement at less than 0.005%, and it is because the effect to conductive enhancement is saturated with \*\* upwards 3.5% of the weight and manufacturability, such as an ingot making and cold-working nature, is checked. Moreover, Mo is specified to 0.001 - 1.5% of the weight for raising the corrosion resistance as a final product by the compound effect with Cr, without degrading Sn-Pb and Ag plating nature, at less than 0.001 % of the weight, the effect to crevice-corrosion nature has few contents of Mo, the effect to crevice-corrosion nature is saturated with \*\* upwards 1.5% of the weight, and a cost becomes large. Furthermore, Cr is specified to 5.5 - 13.5% of the weight in Fe phase for raising the corrosion resistance of a material by the compound effect with the aforementioned Mo, and at less than 5.5 % of the weight, since the effect to corrosion resistance is saturated upwards and Sn-Pb, Ag plating nature, etc. are degraded even if the effect is insufficient and exceeds 13.5 % of the weight, it limits to this domain.

[0012] Furthermore, one sort of Zr, Si, nickel, Zn, Sn, Nb, Zr, P, La, Ce, Y, V, calcium, Be, Mg, or Hf, or two sorts or more 0.005 - 8 % of the weight, Especially the thing for which one sort of C or B or two sorts are added in 0.005 - 2% of the weight of the domain is because it is required when improving an ingot, an organization control of slab, Young's modulus, yield strength and the enhancement in on the strength heat-resistant ], workability, various plating nature, etc., and adds these elements if needed. Cr content in Fe 6% of the weight especially of the component of which Mo content exceeds 0.01 % of the weight Being 0.005 % of the weight or more above-mentioned within the limits, and adding Si, Ti, Zr, La, Ce, Y, Hf, C, B, etc. for a control of a uniform organization It is important, when the organization which accomplishes the characteristic feature of this invention, i.e., Fe phase containing Cr and Mo, and Cu phase carry out detailed variance uniformly and an organization with a thickness of 10 micrometers or less is obtained in the manipulation / heat treatment backplate thick orientation. (It considers as the impurity element mixed unescapable at the time of the product made from a raw material and \*\* except it.)

[0013] It is made the board thickness of lysis and a request after an ingot making after hot rolling, and a primary cold rolling is performed succeedingly. This performs workability grant by subsequent annealing processing by carrying out the primary cold rolling of 50 - 95% of rolling reductions while it obtains board thickness required as a final product. And the annealing at that time is performed by holding for 0.2 - 180 minutes at temperature, i.e., a 800-1000-degree C temperature requirement, required producing recovery recrystallization by manipulation asymmetry accumulated after the primary cold rolling also in \*\*\*\*\*, cooled type (BAF type), and rapid-heating type (continuous-annealing type) any. After performing a secondary cold rolling at 1 - 70% of rolling reductions after that, solution treatment and a quenching are performed, and an aging treatment is performed after that. Although solution treatment is performed by holding for 0.2 - 180 minutes by the 700-1000-degree C temperature requirement in order to \*\*\*\* an addition component in the supersaturation status, an aging treatment can be more effectively performed by quenching as a back process with 0.5-5000 degree-C cooling rate for /. Water and inert gas are used for a quenching as a cooling medium. A 20 or less-aspect ratio organization (the property of a parallel direction and the right-angled orientation was shown in drawing 3 at the rolling direction of an aspect ratio and yield strength) is obtained by the above down stream processing. In addition, if the primary cold rolling of 50 - 95% of rolling reductions is performed to the metal plate of the domain of 1-1.5mm of board thickness, an annealing is subsequently given and a secondary cold rolling is performed in the domain of 1 - 15% of rolling reductions, a property anisotropy (the difference of the property of a parallel direction and the right-angled orientation is mainly told the rolling direction of yield strength, conductivity, and workability here) is more small, and an intensity and conductivity can obtain a much more good metallic foil. Moreover, you may make annealing processing serve as solution treatment by adding the above-mentioned quenching process to the above-mentioned annealing processing.

[0014] In addition, in order that an aging treatment may raise Young's modulus, yield strength, and conductivity, it is indispensable on a manufacturing process and should select proper temperature according to a chemical composition and last process conditions. In order for a fall of conductivity or elongation to arise since asymmetry will arise around a sludge if heating temperature is too low, and to acquire the target conductivity as the condition, a facility constraint and manufacture luminous efficacy are influenced and it becomes the increase of a cost. Moreover, if heating temperature is too high, the amount of precipitations will decrease and it will stop obtaining sufficient yield strength and a heat-resistant intensity. For this reason, the aging treatments for 30 - 500 minutes are proper conditions at 350-650 degrees C.

[0015] Thin plating of Au, Cu, nickel, etc. may be performed in the lead tape foil of this invention, and TAB etc. may secure the quality stability and reliability at the time of commercial production. the above-mentioned metallic foil -- plating after [ nickel, Cu, Ag, and Au ] processing it the shape of a coil, and in the shape of a slit etc., these alloys plating, or Sn- after plating Pb, Sn, etc., or after processing it as a TAB article beforehand, even when performing the aforementioned plating processing, plating is performed on condition that the following

[0016] Plating uses an alkali system degreaser for such a blank, performs electrolysis and an immersing degreasing, and after it activates a front face by the pickling further, it performs the electrical and electric equipment or immersing plating using a desired metal bath or a desired alloy bath. Although the domain of the thickness of a deposit is usually about 0.001-0.02 micrometers, it sees from adhesion, thickness homogeneity, and economical efficiency, and the domain of 0.001-0.01 micrometers is good. In less than 0.001 micrometers, a reliability deteriorates by presence of a pinhole. Moreover, if 0.01 micrometers is exceeded, adhesion and the homogeneity of thickness will deteriorate.

[0017]

[Example]

The chemical composition of D-O of the alloys A-C of the component domain of this invention, P-FF, and the component domain of comparative is shown in example 1 tables 1 and 2.

[Table 1]

\* 比較成分

供試材	Fe	Cu	Cr	Ti	Al	Mo	Mn	その他の 元素	100Cr/ Fe(%)
A	Balance	30.5	6.8	1.0	3.8	0.01	0.15		11.0
B	Balance	49.5	2.8	0.8	3.2	0.03	0.15		6.0
C	Balance	80.3	1.0	0.3	2.2	0.01	0.15		5.6
*D	Balance	15.5	6.0	0.5	2.6	0.02	0.13		7.7
*B	Balance	96.5	0.8	0.5	2.5	0.02	0.15		3.7
*F	Balance	80.3	1.5	0.5	0.25	0.01	0.15		8.5
*G	Balance	80.2	1.5	0.5	12.5	0.05	0.13		8.9
*H	Balance	80.3	1.5	0.5	0.26	0.02	0.03		8.6
*I	Balance	80.6	1.5	0.5	0.23	0.01	3.50		8.6
*J	Balance	80.3	1.5	0.3	0.25	0.02	3.65		8.6
*K	Balance	80.6	1.5	3.7	2.3	0.01	0.15		8.6
*L	Balance	80.3	1.3	0.2	2.2	0.0005	0.15		7.1
*M	Balance	80.3	1.5	0.5	2.3	1.67	0.13		8.5
*N	Balance	80.3	0.5	0.5	2.2	0.02	0.15		2.7
*O	Balance	80.5	2.6	0.5	2.3	0.02	0.13		15.0

[Table 2]

(表1のつゞき)

P	Balance	80.3	1.5	0.5	2.3	0.02	0.13	Zr:0.52	8.7
Q	Balance	80.3	1.2	0.5	2.2	0.01	0.15	Si:0.16	6.7
R	Balance	80.8	1.5	0.5	2.3	0.02	0.13	Ni:0.62	9.1
S	Balance	80.3	1.5	0.5	2.2	0.01	0.15	Zn:0.35	8.7
T	Balance	80.3	1.3	0.5	5.3	0.01	0.13	Sn:0.25	7.4
U	Balance	80.3	1.5	0.5	5.3	0.01	0.13	Nb:0.53	8.7
V	Balance	80.3	1.5	0.5	5.5	0.02	0.15	P :0.76	8.9
W	Balance	80.5	1.5	0.5	5.5	0.02	0.13	La:0.85	9.0
X	Balance	80.3	1.2	0.5	5.3	0.01	0.15	Ce:0.65	6.9
Y	Balance	80.3	1.5	0.3	5.5	0.02	0.13	Y :0.72	8.8
Z	Balance	80.3	1.3	0.5	2.3	0.01	0.35	V :0.63	7.5
AA	Balance	80.6	1.5	0.3	2.2	0.02	0.35	Ca:1.06	9.1
BB	Balance	80.3	1.3	0.5	2.3	0.02	0.33	Br:0.68	7.6
CC	Balance	80.3	1.5	0.5	2.3	0.01	0.35	Mg:0.55	8.7
DD	Balance	80.3	1.5	0.3	2.2	0.02	0.35	Hf:0.23	8.5
EE	Balance	80.3	1.5	0.5	2.3	0.02	0.33	C :0.33	8.6
FF	Balance	80.3	1.5	0.5	2.2	0.01	0.33	B :0.002	8.5

[0018] The quality-of-the-material property of the alloy obtained in Tables 3 and 4 is shown. After having performed hot rolling at 950 degrees C after carrying out lysis casting of the alloy which has the chemical composition shown in A-FF of Tables 1 and 2 in the lysis vacuum ambient atmosphere with high-frequency-induction-heating equipment, and obtaining the metal plate of 1.0mm board thickness, the manipulation back to 0.8mm of board thickness was performed by surface grinding, and the primary cold rolling was performed at 90% of rolling reductions.

[0019] Succeedingly, the annealing was performed for 1 minute at 1000 degrees C, after it performed the secondary cold rolling at 2% of rolling reductions, it performed solution treatment for 30 minutes at 900 degrees C, and it gave the aging treatment of 6 hours at 550 degrees C after water cooling by part for cooling rate/of 3000 degrees C. The \*\*\*\* property asked for proof stress and the maximum intensity 0.2% by the piece (tension speed:10mm/min) of a JIS13B tension test, and measured the property after 5 minute heating at a room temperature and 350 degrees C further. The deformation-proof property was searched for from the amount of deflections by the stiffness (according to ASTM-F 113-77, the bending moment of 150g and cm is given to sample of 10wx50Lxt) appraisal method. Young's modulus was measured by the resonance method (sample size:10wx100Lxt), and it asked for it. Conductivity applied to 4 terminal method correspondingly, corrosion resistance applied to JIS-Z2371 correspondingly, the salt spray test was performed for 96 hours, and it judged with the rate of rust occurrence area in the whole sample surface.

[0020] About Sn-Pb in plating nature, 95% or more was considered as success at the rate of a wetted area. Moreover, Ag plating nature judged Cu strike plating at 430 degrees C among the atmospheric air by occurrence of bulging on the front face after 3 minute heating of plating, after plating after about 0.01 micrometer plating and about 0.01 micrometers of Ag. The property of a rolling Cu foil and an electrolysis Cu foil was also applied to the comparison in front Naka. In addition, test specimens F and H were not able to do a characterization by the hot-working crack.

[0021] A sample number 4 is the case where Cu addition is 20 or less % of the weight, and its conductivity is low. Moreover, since a sample number 5 has few additions of Fe which works effective in Young's modulus by the case where Cu addition is 95 % of the weight or more, Young's modulus and its yield strength are low, and since sample numbers 6, 7, and 8 have many aluminum and Mn additions, conductivity is low [ sample numbers ]. As for a sample number 9, Ti content is inferior in cold-working nature at 3.5% or more. Since a sample number 10 has low Mo, its crevice-corrosion nature is poor, and a sample number 11 has a high cost. Moreover, since a sample number 12 has low Cr, its corrosion resistance is low, and a solder wettability and Ag plating thermal resistance are inferior in a sample number 13.

[0022] this invention with the property excellent compared with the above example of a comparison is clear.

[0023]

[Table 3]

Table 5

試料番号	供試材		左: 0.2 耐力 右: 最大強度 (Kgf/mm <sup>2</sup> )				スティフネス 変形量 (mm)	ヤング率 Kgf Kgf/mm <sup>2</sup>	導電率 % ICS	隙間腐食性	耐食性	半田濡れ性	Agメッキ耐熱性
			室 温		350℃								
1	A	本発明	86	87	86	87	4.1	19800	25	○	○	○	○
2	B	本発明	83	85	80	82	5.6	19100	33	○	○	○	○
3	C	本発明	75	77	75	77	7.7	17500	61	○	○	○	○
4	D	比較例	98	98	98	100	7.6	19800	11	○	○	○	○
5	E	比較例	57	62	57	62	8.5	14500	63	○	○	○	○
6	G	比較例	65	70	65	70	8.0	16100	13	○	○	○	○
7	I	比較例	83	85	83	85	7.2	17200	15	○	○	○	○
8	J	比較例	77	78	76	78	7.5	17000	13	○	○	○	○
9	K	比較例	77	78	76	78	7.3	17100	70	○	○	○	○
10	L	比較例	76	78	75	80	7.5	17200	60	△	○	○	○
11	M	比較例	77	78	75	78	7.6	17000	62	○	○	○	○
12	N	比較例	75	77	75	77	7.6	17000	65	△	△	○	○
13	O	比較例	77	78	75	78	7.3	17100	63	○	○	△	△

[Table 4]

(表3のつぎ)

14	P	本発明	75	79	78	79	7.5	17100	63	○	○	○	○
15	Q	本発明	76	80	79	80	7.5	17000	63	○	○	○	○
16	R	本発明	76	81	80	81	7.6	17000	63	○	○	○	○
17	S	本発明	74	78	77	78	7.5	17000	63	○	○	○	○
18	T	本発明	75	79	78	79	7.5	17100	63	○	○	○	○
19	U	本発明	76	80	79	80	7.3	17200	65	○	○	○	○
20	V	本発明	76	81	80	81	7.3	17100	65	○	○	○	○
21	W	本発明	76	80	79	80	7.5	17100	63	○	○	○	○
22	X	本発明	76	80	79	80	7.3	17000	65	○	○	○	○
23	Y	本発明	76	81	80	81	7.2	17000	65	○	○	○	○
24	Z	本発明	77	81	80	81	7.3	17100	65	○	○	○	○
25	AA	本発明	75	80	78	80	7.5	17100	63	○	○	○	○
26	BB	本発明	77	81	80	81	7.5	17000	63	○	○	○	○
27	CC	本発明	75	82	81	82	7.6	17000	65	○	○	○	○
28	DD	本発明	78	83	82	83	7.3	17000	65	○	○	○	○
29	EE	本発明	78	82	81	82	7.6	17100	63	○	○	○	○
30	FF	本発明	78	82	81	82	7.3	17100	63	○	○	○	○
圧延Cu箔		比較例	31.0	36.0	28.5	33.5	15.2	13200	96	○	○	○	○
電解Cu箔		比較例	33.5	38.5	32.5	36.5	13.5	13000	98	○	○	○	○

[0024] Example 2 table 5 showed evaluation of the material obtained after processing the test specimens C and P shown in Tables 1 and 2 at the following process. That is, after performing surface grinding to the metal plate of 1mm board thickness obtained with hot rolling, the primary cold rolling was performed in the domain of 35 - 96% of rolling reductions, it considered as sheet metal of 0.055mm of board thickness, and the annealing was given to this sheet metal for 60 seconds at 1000 degrees C, and after cooling with 100 degree-C cooling rate for /with nitrogen gas, the secondary cold rolling was performed at 1 - 75% of the rates of rolling. Thus, after changing an aspect ratio to 1.3-23.5, the aging treatment of 6 hours is performed at 550 degrees C, evaluation of the Young's modulus in a rolling direction, parallel (L) and a rolling direction, and a right angle (C), yield strength, conductivity, and workability (it judges by adhesion bending) is obtained, and this result is shown in the above-mentioned table. Evaluation of an aspect ratio used the average of the organization length ratio in 1/4 layer of the board thickness in a rolling-direction cross section ] the rolling direction and the orientation of board thickness of ten visual fields by 100 times as many organization observation as this with the light microscope. The characterization measured about Young's modulus, yield strength, and conductivity like the example 1. It is clear that the material which has the Young's modulus, the yield strength, and conductivity which a property anisotropy is small and were excellent in making it 20 or less aspect ratio by this method from the following results is obtained. In addition, it reaches sample No.31, since the rate of a primary cold rolling has not satisfied the conditions of this invention, 37 is not recrystallized, but workability has deteriorated.

[0025]

[Table 5]

試料番号	供試材		一次冷間圧延率 (%)	二次冷間圧延率 (%)	アスペクト比	降伏強度 (Kgf/mm <sup>2</sup> )		導電性 (%IACS)		加工性	
						L	C	L	C	L	C
31	C	比較例	35	1	1.3	80	80	63	63	○	△
32	C	本発明	55	1	1.7	82	80	65	63	○	○
33	C	本発明	60	5	2.8	81	80	65	63	○	○
34	C	本発明	90	20	12.5	82	81	65	63	○	○
35	C	本発明	93	30	17.5	85	83	65	62	○	○
36	C	比較例	96	75	23.5	87	75	65	58	○	○
37	P	比較例	35	1	1.3	80	80	63	66	○	△
38	P	本発明	55	1	1.7	81	80	65	66	○	○
39	P	本発明	60	5	2.8	81	80	67	65	○	○
40	P	本発明	90	20	12.5	82	81	67	66	○	○
41	P	本発明	93	30	17.5	83	83	67	65	○	○
42	P	比較例	96	75	23.5	83	73	68	60	○	○

[0026]

[Effect of the invention] Since the metallic foil which excelled [ this invention ] in a lead-proof deformation property and thermal resistance as a lead foil for TAB, and was excellent in high Young's modulus, high yield strength, and conductivity can be offered, the industrial effect is remarkable.

[Translation done.]

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**TECHNICAL FIELD**

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[Field of the Invention] this invention is an electric conduction foil material for connection to the external circuit of a semiconductor integrated circuit element, and relates to the tape-like metallic foil used by the TAB method etc.

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[Translation done.]

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PRIOR ART

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[Prior art] It was common that the electrode pad for external circuit connection made from aluminum was conventionally prepared on a semiconductor integrated circuit element, and this electrode pad was connected with wires, such as external circuits, such as a leadframe ceramic substrate, and Au line. However, in IC by which today was integrated highly, in order to make the number of the above-mentioned pads increase sharply, by extension of the conventional technique, the radical technical innovation on manufacturability, manipulation technique, and wire connection is needed, the TAB method of the simultaneous bonding method using a lead tape etc. is put in practical use by the part, and increasing increasingly from now on is expected.

[0003] After pasting up an electrolysis Cu foil or a rolling Cu foil on the insulating resin material (many are polyimide films) by which opening was beforehand carried out in the lead section generally, a lead circuit is made to form by photoresist etching. The cross section of two examples which constituted this in TAB is shown in drawing 1 (A, B). Moreover, thermocompression bonding of Si chip, bump material, such as Au, and the nose of cam of the lead for connection is carried out at the time of a package, Au, Sn-Pb plating, etc. are given beforehand, and after heating at 250-350 degrees C, connection combination is carried out with the bump section.

[0004] In the semiconductor integrated circuit by which small high integration was carried out, narrow-izing of a connection lead is important and there is, in order to be these implementation, it is required for a lead-on etching processing tape to have the shape of a foil 50 micrometers or less, this lead tape suppresses the deformation at the time of a manufacture further, and a high temperature strength is high, and a flexibility is also demanded in a bending package type. moreover, the difference (anisotropy) of the property in a rolling direction and the rolling right-angled orientation -- the parvus -- things are important Since the deformation-proof property, the heat-resistant intensity, and the anisotropy are inferior to an electrolysis foil in the existing rolling Cu foil, although there is technique indicated by the Provisional-Publication-No. 189738 [ 62 to ] official report which has improved these properties, in order to suppress the deformation on a manufacture of the TAB method used by the thickness of 50 micrometers or less, and a heat-resistant deformation property, the effect to this property is small and the enhancement only in an intensity of the deformation-proof property of a lead was inadequate.

[0005] As a result of this invention person's conducting various experiments about this, what (setting in the status that the conductive fall was also suppressed in the domain which is satisfactory practically) deformation can be suppressed for by the enhancement ( drawing 2 ) in large Young's modulus and enhancement in yield strength by adding Fe in 20 - 95% of the weight of the domain in Cu became clear. This means the importance of raising the Young's modulus effectively committed not only in the maximum intensity but in a deformation-proof property in the deformation-proof property of a lead. Moreover, the same effect is acquired by performing nickel addition as a means which raises Young's modulus with Cu base alloy (Japan Brass Makers Association).

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EFFECT OF THE INVENTION

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[Effect of the invention] Since the metallic foil which excelled [ this invention ] in a lead-proof deformation property and thermal resistance as a lead foil for TAB, and was excellent in high Young's modulus, high yield strength, and conductivity can be offered, the industrial effect is remarkable.

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**TECHNICAL PROBLEM**

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[Object of the Invention] this invention aims at offering the manufacture technique that the metallic foil which has the high Young's modulus and quantity yield strength which was excellent in the lead-proof deformation property and the heat-resistant strength property as this lead foil for TAB, and this metallic foil are realizable by the low cost.

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**MEANS**

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[The means for solving a technical problem] The place made into the summary of this invention contains Cu:20-95 % of the weight, aluminum:0.3-11 % of the weight, Mn:0.05-3.0 % of the weight, Ti:0.005-3.5 % of the weight, and Mo:0.001-1.5 % of the weight, and is in the metallic foil characterized by the aspect ratios of a grain size number being 20 or less and 80 micrometers or less of board thickness in the alloy with which the remainder consists of an unescapable impurity and Fe.

[0008] The metallic foil of this invention carries out the hot rolling of the ingot or slab with the above-mentioned composition to the metal plate of 1.0-8mm board thickness at the temperature of 700-1000 degrees C. It is what is obtained by giving an annealing succeeding after performing 50 - 95% of a primary cold rolling, performing the secondary cold rolling of 1 - 15% of rolling reductions subsequently, performing the quenching after solution treatment further, continuing, and giving an aging treatment. An aspect ratio can obtain the metallic foil which has the parvus and the high Young's modulus, and high yield strength of a property anisotropy or less by 20. It is characterized by furthermore giving plating after [ nickel, Cu, Ag, and Au ] processing it the shape of the status and a tape of a coil etc. or these alloys plating and Sn-Pb plating, or 0.001-0.02 micrometers of Sn plating in a monolayer or a double layer.

[0009] in order to obtain the above-mentioned metal sheet metal in this invention -- the combination of each conditions of a chemical composition, a casting condition and primary one, and a secondary cold rolling, an annealing and an aging treatment and nickel, Cus, Aus and Ag or those alloy plating, and Sn- the plating conditions of Pb and Sn etc. were specified

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## OPERATION

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[Operation] The ground for limitation of the requirements for a configuration of this invention is explained below. First, the ground for limitation of the chemical composition of an alloy is as follows. As compulsion \*\*\*\* of a lot of Fe, Zr, Cr, etc. in Cu is carried out in order to obtain high Young's modulus and high yield strength by Fe-Cu foil alloy composition of this invention, and shown in drawing 2, Fe content is 15000kg and f/mm<sup>2</sup> at 5% or more. Although the above high Young's modulus is obtained, at less than 5%, conductivity with it is not acquired. [ the aforementioned small effect and ] [ sufficient at 80% or more ] In addition, in this invention, proof stress was made into yield strength 0.2%.

[0011] Specifying aluminum to 0.3 - 11.0% of the weight below has few enhancement effects to hot-working nature at less than 0.3%, and it is because the hot-working disposition top effect is saturated with \*\* upwards 11.0% of the weight and a cost becomes large. Furthermore, at less than 0.05 % of the weight, hot-working nature is raised by the compound effect with aluminum, Mn has few effects, and since an effect is saturated with \*\* 3% of the weight, it is specified in 0.05 - 3.0% of the weight of a domain. Moreover, specifying Ti to 0.005 - 3.5% of the weight has few effects to conductive enhancement at less than 0.005%, and it is because the effect to conductive enhancement is saturated with \*\* upwards 3.5% of the weight and manufacturability, such as an ingot making and cold-working nature, is checked. Moreover, Mo is specified to 0.001 - 1.5% of the weight for raising the corrosion resistance as a final product by the compound effect with Cr, without degrading Sn-Pb and Ag plating nature, at less than 0.001 % of the weight, the effect to crevice-corrosion nature has few contents of Mo, the effect to crevice-corrosion nature is saturated with \*\* upwards 1.5% of the weight, and a cost becomes large. Furthermore, Cr is specified to 5.5 - 13.5% of the weight in Fe phase for raising the corrosion resistance of a material by the compound effect with the aforementioned Mo, and at less than 5.5 % of the weight, since the effect to corrosion resistance is saturated upwards and Sn-Pb, Ag plating nature, etc. are degraded even if the effect is insufficient and exceeds 13.5 % of the weight, it limits to this domain.

[0012] Furthermore, one sort of Zr, Si, nickel, Zn, Sn, Nb, Zr, P, La, Ce, Y, V, calcium, Be, Mg, or Hf, or two sorts or more 0.005 - 8 % of the weight, Especially the thing for which one sort of C or B or two sorts are added in 0.005 - 2% of the weight of the domain is because it is required when improving an ingot, an organization control of slab, Young's modulus, yield strength and the enhancement in on the strength heat-resistant ], workability, various plating nature, etc., and adds these elements if needed. Cr content in Fe 6% of the weight especially of the component of which Mo content exceeds 0.01 % of the weight Being 0.005 % of the weight or more above-mentioned within the limits, and adding Si, Ti, Zr, La, Ce, Y, Hf, C, B, etc. for a control of a uniform organization It is important, when the organization which accomplishes the characteristic feature of this invention, i.e., Fe phase containing Cr and Mo, and Cu phase carry out detailed variance uniformly and an organization with a thickness of 10 micrometers or less is obtained in the manipulation / heat treatment backplate thick orientation. (It considers as the impurity element mixed unescapable at the time of the product made from a raw material and \*\* except it.)

[0013] It is made the board thickness of lysis and a request after an ingot making after hot rolling, and a primary cold rolling is performed succeedingly. This performs workability grant by subsequent annealing processing by carrying out the primary cold rolling of 50 - 95% of rolling reductions while it obtains board thickness required as a final product. And the annealing at that time is performed by holding for 0.2 - 180 minutes at temperature, i.e., a 800-1000-degree C temperature requirement, required producing recovery recrystallization by manipulation asymmetry accumulated after the primary cold rolling also in \*\*\*\*\*, cooled type (BAF type), and rapid-heating type (continuous-annealing type) any. After performing a secondary cold rolling at 1 - 70% of rolling reductions after that, solution treatment and a quenching are performed, and an aging treatment is performed after that. Although solution treatment is performed by holding for 0.2 - 180 minutes by the 700-1000-degree C temperature requirement in order to \*\*\*\* an addition component in the supersaturation status, an aging treatment can be more effectively performed by quenching as a back process with 0.5-5000 degree-C cooling rate for /. Water and inert gas are used for a quenching as a cooling medium. A 20 or less-aspect ratio organization (the property of a parallel direction and the right-angled orientation was shown in drawing 3 at the rolling direction of an aspect ratio and yield strength) is obtained by the above down stream processing. In addition, if the primary cold rolling of 50 - 95% of rolling reductions is performed to the metal plate of the domain of 1-1.5mm of board thickness, an annealing is subsequently given and a secondary cold rolling is performed in the domain of 1 - 15% of rolling reductions, a property anisotropy (the difference of the property of a parallel direction and the right-angled orientation is mainly told the rolling direction of yield strength, conductivity, and workability here) is more small, and an intensity and conductivity can obtain a much more good metallic foil. Moreover, you may make annealing processing serve as solution treatment by adding the above-mentioned quenching process to the above-mentioned annealing processing.

[0014] In addition, in order that an aging treatment may raise Young's modulus, yield strength, and conductivity, it is indispensable on a manufacturing process and should select proper temperature according to a chemical composition and last process conditions. In order for a fall of conductivity or elongation to arise since asymmetry will arise around a sludge if heating temperature is too low, and to acquire the target conductivity as the condition, a facility constraint and manufacture luminous efficacy are influenced and it becomes the increase of a cost. Moreover, if heating temperature is too high, the amount of precipitations will decrease and it will stop obtaining sufficient yield strength and a heat-resistant intensity. For this reason, the aging treatments for 30 - 500 minutes are proper conditions at 350-650 degrees C.

[0015] Thin plating of Au, Cu, nickel, etc. may be performed in the lead tape foil of this invention, and TAB etc. may secure the quality

stability and reliability at the time of commercial production. the above-mentioned metallic foil -- plating after [ nickel, Cu, Ag, and Au ] processing it the shape of a coil, and in the shape of a slit etc., these alloys plating, or Sn- after plating Pb, Sn, etc., or after processing it as a TAB article beforehand, even when performing the aforementioned plating processing, plating is performed on condition that the following [0016] Plating uses an alkali system degreaser for such a blank, performs electrolysis and an immersing degreasing, and after it activates a front face by the pickling further, it performs the electrical and electric equipment or immersing plating using a desired metal bath or a desired alloy bath. Although the domain of the thickness of a deposit is usually about 0.001-0.02 micrometers, it sees from adhesion, thickness homogeneity, and economical efficiency, and the domain of 0.001-0.01 micrometers is good. In less than 0.001 micrometers, a reliability deteriorates by presence of a pinhole. Moreover, if 0.01 micrometers is exceeded, adhesion and the homogeneity of thickness will deteriorate.

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EXAMPLE

[Example]

The chemical composition of D-O of the alloys A-C of the component domain of this invention, P-FF, and the component domain of comparative is shown in example 1 tables 1 and 2.

[Table 1]

\* 比較成分

供試材	Fe	Cu	Cr	Ti	Al	Mo	Mn	その他の 元素	100Cr/ Fe(%)
A	Balance	30.5	6.8	1.0	3.8	0.01	0.15		11.0
B	Balance	49.5	2.8	0.8	3.2	0.03	0.15		6.0
C	Balance	80.3	1.0	0.3	2.2	0.01	0.15		5.6
*D	Balance	15.5	6.0	0.5	2.6	0.02	0.13		7.7
*B	Balance	96.5	0.8	0.5	2.5	0.02	0.15		3.7
*F	Balance	80.3	1.5	0.5	0.25	0.01	0.15		8.5
*G	Balance	80.2	1.5	0.5	12.5	0.05	0.13		8.9
*H	Balance	80.3	1.5	0.5	0.26	0.02	0.03		8.6
*I	Balance	80.6	1.5	0.5	0.23	0.01	3.50		8.6
*J	Balance	80.3	1.5	0.3	0.25	0.02	3.65		8.6
*K	Balance	80.6	1.5	3.7	2.3	0.01	0.15		8.6
*L	Balance	80.3	1.3	0.2	2.2	0.0005	0.15		7.1
*M	Balance	80.3	1.5	0.5	2.3	1.67	0.13		8.5
*N	Balance	80.3	0.5	0.5	2.2	0.02	0.15		2.7
*O	Balance	80.5	2.6	0.5	2.3	0.02	0.13		15.0

[Table 2]

(表1のつゞき)

P	Balance	80.3	1.5	0.5	2.3	0.02	0.13	Zr:0.52	8.7
Q	Balance	80.3	1.2	0.5	2.2	0.01	0.15	Si:0.16	6.7
R	Balance	80.8	1.5	0.5	2.3	0.02	0.13	Ni:0.62	9.1
S	Balance	80.3	1.5	0.5	2.2	0.01	0.15	Zn:0.35	8.7
T	Balance	80.3	1.3	0.5	5.3	0.01	0.13	Sn:0.25	7.4
U	Balance	80.3	1.5	0.5	5.3	0.01	0.13	Nb:0.53	8.7
V	Balance	80.3	1.5	0.5	5.5	0.02	0.15	P :0.76	8.9
W	Balance	80.5	1.5	0.5	5.5	0.02	0.13	La:0.85	9.0
X	Balance	80.3	1.2	0.5	5.3	0.01	0.15	Ce:0.65	6.9
Y	Balance	80.3	1.5	0.3	5.5	0.02	0.13	Y :0.72	8.8
Z	Balance	80.3	1.3	0.5	2.3	0.01	0.35	V :0.63	7.5
AA	Balance	80.6	1.5	0.3	2.2	0.02	0.35	Ca:1.06	9.1
BB	Balance	80.3	1.3	0.5	2.3	0.02	0.33	Br:0.68	7.6
CC	Balance	80.3	1.5	0.5	2.3	0.01	0.35	Mg:0.55	8.7
DD	Balance	80.3	1.5	0.3	2.2	0.02	0.35	Hf:0.23	8.5
EE	Balance	80.3	1.5	0.5	2.3	0.02	0.33	C :0.33	8.6
FF	Balance	80.3	1.5	0.5	2.2	0.01	0.33	B :0.002	8.5

[0018] The quality-of-the-material property of the alloy obtained in Tables 3 and 4 is shown. After having performed hot rolling at 950 degrees C after carrying out lysis casting of the alloy which has the chemical composition shown in A-FF of Tables 1 and 2 in the lysis vacuum ambient atmosphere with high-frequency-induction-heating equipment, and obtaining the metal plate of 1.0mm board thickness, the manipulation back to 0.8mm of board thickness was performed by surface grinding, and the primary cold rolling was performed at 90% of rolling reductions.

[0019] Succeedingly, the annealing was performed for 1 minute at 1000 degrees C, after it performed the secondary cold rolling at 2% of rolling reductions, it performed solution treatment for 30 minutes at 900 degrees C, and it gave the aging treatment of 6 hours at 550 degrees C after water cooling by part for cooling rate/of 3000 degrees C. The \*\*\*\* property asked for proof stress and the maximum intensity 0.2% by the piece (tension speed:10mm/min) of a JIS13B tension test, and measured the property after 5 minute heating at a room temperature and 350 degrees C further. The deformation-proof property was searched for from the amount of deflections by the stiffness (according to ASTM-F 113-77, the bending moment of 150g and cm is given to sample of 10wx50Lxt) appraisal method. Young's modulus was measured by the resonance method (sample size:10wx100Lxt), and it asked for it. Conductivity applied to 4 terminal method correspondingly, corrosion resistance applied to JIS-Z2371 correspondingly, the salt spray test was performed for 96 hours, and it judged with the rate of rust occurrence area in the whole sample surface.

[0020] About Sn-Pb in plating nature, 95% or more was considered as success at the rate of a wetted area. Moreover, Ag plating nature judged Cu strike plating at 430 degrees C among the atmospheric air by occurrence of bulging on the front face after 3 minute heating of plating, after plating after about 0.01 micrometer plating and about 0.01 micrometers of Ag. The property of a rolling Cu foil and an electrolysis Cu foil was also applied to the comparison in front Naka. In addition, test specimens F and H were not able to do a characterization by the hot-working crack.

[0021] A sample number 4 is the case where Cu addition is 20 or less % of the weight, and its conductivity is low. Moreover, since a sample number 5 has few additions of Fe which works effective in Young's modulus by the case where Cu addition is 95 % of the weight or more, Young's modulus and its yield strength are low, and since sample numbers 6, 7, and 8 have many aluminum and Mn additions, conductivity is low [ sample numbers ]. As for a sample number 9, Ti content is inferior in cold-working nature at 3.5% or more. Since a sample number 10 has low Mo, its crevice-corrosion nature is poor, and a sample number 11 has a high cost. Moreover, since a sample number 12 has low Cr, its corrosion resistance is low, and a solder wettability and Ag plating thermal resistance are inferior in a sample number 13.

[0022] this invention with the property excellent compared with the above example of a comparison is clear.

[0023]

[Table 3]

Table 5

試料番号	供試材		左：0.2 耐力 右：最大強度 (Kg $\text{f}/\text{mm}^2$ )				スティ フネス 変形量 (mm)	ヤング 率 Kg $\text{f}$  Kg $\text{f}/\text{mm}^2$	導電率 % IACS	隙間腐食性	耐食性	半田濡れ性	Agメッキ耐熱性
			室 温		350℃								
1	A	本発明	86	87	86	87	4.1	19800	25	○	○	○	○
2	B	本発明	83	85	80	82	5.6	19100	33	○	○	○	○
3	C	本発明	75	77	75	77	7.7	17500	61	○	○	○	○
4	D	比較例	98	98	98	100	7.6	19800	11	○	○	○	○
5	E	比較例	57	62	57	62	8.5	14500	63	○	○	○	○
6	G	比較例	65	70	65	70	8.0	16100	13	○	○	○	○
7	I	比較例	83	85	83	85	7.2	17200	15	○	○	○	○
8	J	比較例	77	78	76	78	7.5	17000	13	○	○	○	○
9	K	比較例	77	78	76	78	7.3	17100	70	○	○	○	○
10	L	比較例	76	78	75	80	7.5	17200	60	△	○	○	○
11	M	比較例	77	78	75	78	7.6	17000	62	○	○	○	○
12	N	比較例	75	77	75	77	7.6	17000	65	△	△	○	○
13	O	比較例	77	78	75	78	7.3	17100	63	○	○	△	△

[Table 4]

(表3のつぎ)

14	P	本発明	75	79	78	79	7.5	17100	63	○	○	○	○
15	Q	本発明	76	80	79	80	7.5	17000	63	○	○	○	○
16	R	本発明	76	81	80	81	7.6	17000	63	○	○	○	○
17	S	本発明	74	78	77	78	7.5	17000	63	○	○	○	○
18	T	本発明	75	79	78	79	7.5	17100	63	○	○	○	○
19	U	本発明	76	80	79	80	7.3	17200	65	○	○	○	○
20	V	本発明	76	81	80	81	7.3	17100	65	○	○	○	○
21	W	本発明	76	80	79	80	7.5	17100	63	○	○	○	○
22	X	本発明	76	80	79	80	7.3	17000	65	○	○	○	○
23	Y	本発明	76	81	80	81	7.2	17000	65	○	○	○	○
24	Z	本発明	77	81	80	81	7.3	17100	65	○	○	○	○
25	AA	本発明	75	80	78	80	7.5	17100	63	○	○	○	○
26	BB	本発明	77	81	80	81	7.5	17000	63	○	○	○	○
27	CC	本発明	75	82	81	82	7.6	17000	65	○	○	○	○
28	DD	本発明	78	83	82	83	7.3	17000	65	○	○	○	○
29	EE	本発明	78	82	81	82	7.6	17100	63	○	○	○	○
30	FF	本発明	78	82	81	82	7.3	17100	63	○	○	○	○
圧延Cu箔			比較例	31.0	36.0	28.5	33.5	15.2	13200	96	○	○	○
電解Cu箔			比較例	33.5	38.5	32.5	36.5	13.5	13000	98	○	○	○

[0024] Example 2 table 5 showed evaluation of the material obtained after processing the test specimens C and P shown in Tables 1 and 2 at the following process. That is, after performing surface grinding to the metal plate of 1mm board thickness obtained with hot rolling, the primary cold rolling was performed in the domain of 35 - 96% of rolling reductions, it considered as sheet metal of 0.055mm of board thickness, and the annealing was given to this sheet metal for 60 seconds at 1000 degrees C, and after cooling with 100 degree-C cooling rate for /with nitrogen gas, the secondary cold rolling was performed at 1 - 75% of the rates of rolling. Thus, after changing an aspect ratio to 1.3-23.5, the aging treatment of 6 hours is performed at 550 degrees C, evaluation of the Young's modulus in a rolling direction, parallel (L) and a rolling direction, and a right angle (C), yield strength, conductivity, and workability (it judges by adhesion bending) is obtained, and this result is shown in the above-mentioned table. Evaluation of an aspect ratio used the average of the organization length ratio in 1/4 layer of the board thickness in a rolling-direction cross section ] the rolling direction and the orientation of board thickness of ten visual fields by 100 times as many organization observation as this with the light microscope. The characterization measured about Young's modulus, yield strength, and conductivity like the example 1. It is clear that the material which has the Young's modulus, the yield strength, and conductivity which a property anisotropy is small and were excellent in making it 20 or less aspect ratio by this method from the following results is obtained. In addition, it reaches sample No.31, since the rate of a primary cold rolling has not satisfied the conditions of this invention, 37 is not recrystallized, but workability has deteriorated.

[0025]

[Table 5]

試料 番号	供 試材		一次冷 間圧延 率 (%)	二次冷 間圧延 率 (%)	アス ペク ト比	降伏強度 (Kgf/mm <sup>2</sup> )		導電性 (%IACS)		加工性	
						L	C	L	C	L	C
31	C	比較例	35	1	1.3	80	80	63	63	○	△
32	C	本発明	55	1	1.7	82	80	65	63	○	○
33	C	本発明	60	5	2.8	81	80	65	63	○	○
34	C	本発明	90	20	12.5	82	81	65	63	○	○
35	C	本発明	93	30	17.5	85	83	65	62	○	○
36	C	比較例	96	75	23.5	87	75	65	58	○	○
37	P	比較例	35	1	1.3	80	80	63	66	○	△
38	P	本発明	55	1	1.7	81	80	65	66	○	○
39	P	本発明	60	5	2.8	81	80	67	65	○	○
40	P	本発明	90	20	12.5	82	81	67	66	○	○
41	P	本発明	93	30	17.5	83	83	67	65	○	○
42	P	比較例	96	75	23.5	83	73	68	60	○	○

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**DESCRIPTION OF DRAWINGS**

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[An easy explanation of a drawing]

[ Drawing 1 ] It is the cross section of two kinds of common bilayer TAB tapes.

[ Drawing 2 ] It is drawing showing Cu content in Fe phase (%), Young's modulus, and the relation with conductivity.

[ Drawing 3 ] It is drawing showing the relation of the anisotropy of an aspect ratio and yield strength.

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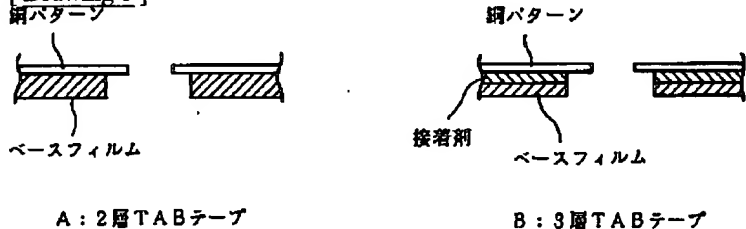
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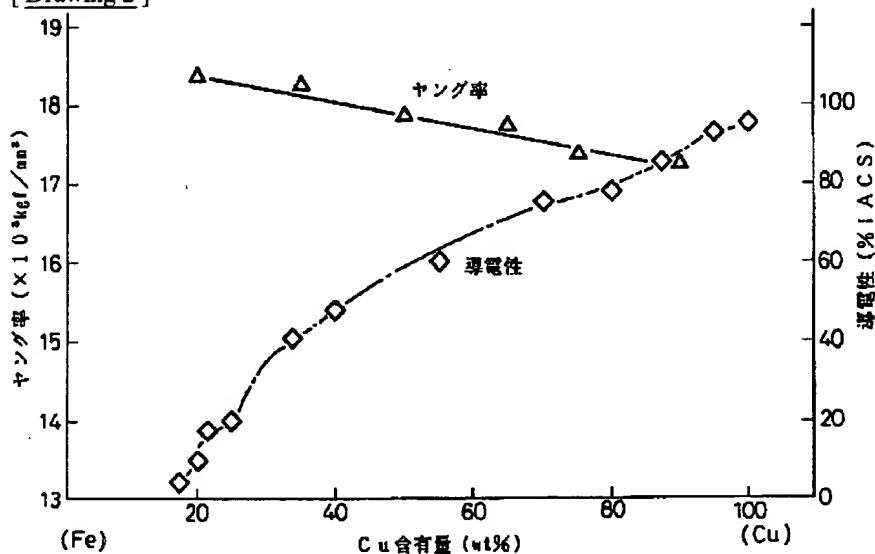
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## DRAWINGS

[Drawing 1]



[Drawing 2]



[Drawing 3]

